Insider Trading and the Long-run Performance of IPOs

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Forthcoming European Financial Management

Abstract:

We use a unique dataset to assess whether IPOs where insiders change their holdings have different long-term returns. We find that IPOs where insiders are net sellers are more likely to generate positive long-run returns, while those where they are net buyers underperform. The analysis of individual trades shows that insiders sell when their IPO reaches its optimal value as the excess returns are positive in the pre-event and not significant in the post-event period. For the buy trades the returns are negative in both the pre- and post-trade periods, suggesting that insiders buy to support the price of their IPO, but the post-event returns are not as expected. These results imply that insider trading is a response to firm's past performance. The valuation uncertainty of IPOs and the specific motivations to trade weaken the precision of the information content of insider trading and its impact on IPO long-run returns.

Key words: Long run IPO performance, insider trades, London Stock Exchange, market timing.

JEL Classification: G12, G14, G24.

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We gratefully acknowledge comments from seminar participants at Cass Business School, Manchester Business School and Manchester Business School. All remaining errors are our own responsibility

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1. Introduction

Previous studies show that IPOs generate no or negative excess returns in the long run. This relatively low performance emanates from a combination of extreme differences of opinion among investors, costly short selling, and small public floats on many IPOs.[1] In this paper, we contribute to this extensive literature by assessing the characteristics of IPOs in which insiders, defined as board members, are net buyers and net sellers, and whether their trades are related to the long-run performance of IPOs. We address the following questions: Do IPOs in which insiders are net sellers underperform relative to those in which they are net buyers? If so, does this difference in performance occur before or after their trades, and therefore, do insiders trade to respond to their IPOs' past performance or to signal future stock price performance? We construct a unique hand-collected dataset of 830 UK IPOs containing all information from prospectuses and insider trading events, and we use relevant accounting and stock price data, three-years after the IPO date, to answer these questions.

Studies on insider trading show that aggregate insider trading activity significantly predicts future market returns, because insiders are likely to trade on private information and to know better the true value of their firm than outside investors (e.g., Seyhun, 1998). For example, Lakonishok and Lee (2001) form portfolios based on the net purchase ratio, *NPR*, defined as insider net purchases over total transactions, and find that insider purchases, not sells, are more likely to predict future stock returns, and insider trading informativeness is more pronounced in smaller firms. In this paper we focus on the impact of *NPR* on the long-run performance of IPOs. First, we compute the 36-months returns for each of our IPOs, and then assess whether IPOs where insiders are net buyers (sellers) over this sample period generate positive (negative) returns. We then analyse individual trades to assess whether this excess performance explains or is driven by insider trading.

In line with previous evidence on insider trading, we expect insiders to be contrarians by buying shares if their IPO is underperforming, and selling if it is over-performing. On the announcement date and post-trade period, share prices will increase for the buy and decrease for the sell trades. Such results will be consistent with the proposition that insiders trade on private information that may emanate from their assessment of the true value of their firm, or subsequent news releases. This will imply that insiders reduce the IPOs' inherent information asymmetries, and, thus, their trades will affect the short- and long-run returns of their firm.

We find contrasting results to our expectations as IPOs where insiders are net sellers (*Net Sell*) generate positive returns, while those where they are net buyers (*Net Buy*) underperform substantially throughout the 36-months post-IPO period. We find similar results using the style-adjusted, equal and value-weighted cumulative abnormal returns, and the Fama and French (1993) three-factor model. Our regression results provide further support for these results, as the coefficient of NPR, defined in terms of trading volume or value, is negative and significant, suggesting that *Net Sell* (*Net Buy*) IPOs generate positive (negative) long-run returns, even after accounting for all the IPOs' fundamental factors.

We investigate further the causality of our results, the drivers of this asymmetric performance, the timing ability of insiders, and the information content of insider trading, by assessing the market reaction to each individual trade. We find that the pre-sell trades' excess returns are positive and significant. On the announcement date, share prices decrease, but, in the post trade period, they are mainly not significant, suggesting that insiders time their trades by selling when they know that the price of their IPO is stabilised with no more gains to achieve. In contrast, for the buy trades, we find significant negative excess returns in the pre- and post-event periods. While the buy trades of insiders in failing IPOs may be consistent with the price support hypothesis,[2] our results indicate that this aim is not achieved as the post-trade returns are not positive. Overall, our results suggest that insider trading is likely to be driven by the long-run performance of IPOs.

The analysis of insiders' trading patterns shows that the trades are not clustered around the lockup expiry dates; they are relatively evenly distributed across the 36 months sample period as the median number of years from the IPO date to the trading date is 1.45 years for both the *Net Buy* and *Net Sell* samples. When we split our sample period into two subsamples: months 2 to 18 and months 19 to 36, we show that the excess returns of *Net Sell* IPOs are positive in the first period, but not significant in the remaining months, but for the *Net Buy* IPOs, they are negative in both sub-periods. Since at the time of the IPO investors cannot separate firms on the basis of subsequent insider trading, which, according to Hoque and Lasfer (2011) cannot be predicted even during the lockup period, we account for any look-ahead bias in our results by analysing the long-term returns from the trading rather than the IPO date. We find similar event study results, and the portfolio of *Net Sell* (*Net Buy*) IPOs earns positive (negative) alphas in the Fama-French calendar time 3-factor regressions. Our results imply that insiders respond to past performance and do not trade on insider information, although, in line with previous studies, they are contrarians, and Brennan and Cao (1997) argue that contrarian investors are likely to trade on insider information.

Why do insiders adopt such strategies? Our results could simply imply that, in line with the disposition effect in behavioural finance, insiders may exhibit a tendency to sell winners and hold on to losers for too long, because realising profits allows them to maintain self-esteem, but realising losses causes them to admit failure implicitly. While this may remain a possibility, we are not aware of other means of testing further this hypothesis.[3] Instead, we provide alternative explanations for our results which may be specific to IPOs. Huddart and Ke (2007) argue that the impact of insider trading depends on two fundamental factors: the precision of the insider's information and the level of uncertainty in the marketplace regarding the firm's value. We consider that, in the case of IPOs, there is great uncertainty about the value of the firm, and the information of insiders is likely to be less precise, resulting in low excess returns. This argument is likely to explain the behavior of

stock prices around the buy trade which appears to be a weak signal, unlike that in seasoned firms. Nevertheless, we find that *Net Buy* IPOs perform better than *No Trade* IPOs, suggesting that the former IPOs could have had a worst performance without the buy trades of insiders. On the other hand, *Net Sell* IPOs are likely to have low information asymmetries as they perform well before the sell trades. Their signal is also weak as the post-trade returns are not negative, but the results suggest that these IPOs have reached their optimal valuation.

Our paper contributes to two main areas of research that are not so far considered conjointly: IPO long-run performance and insider trading. Although investors cannot predict at the time of the IPO the decision by insiders to trade, we show that these trades are affected by the IPOs' long-run returns, but not by the previously documented factors that affect the long-run returns such as underpricing (Morris, 1996; Jenkinson and Ljungqvist, 2001), overhang (Mikkelson et al., 1997), reputation of underwriters (Carter and Manaster, 1990), venture capitalist (Brav and Gompers, 1997, Krishnan et al, 2011), and private equity backing (Levis, 2011). Our results may be specific to IPOs as they do not indicate that insider trading mitigates the information asymmetry as is the case for seasoned firms (See Korczak et al (2010) for recent review), and they also do not support Marin and Oliver (2008) who find that insiders sell up to 12 months before large monthly price drops, but buy one month before a large price jumps, and Jiang and Zaman (2010) who show that insiders' ability to predict future cash flow news, rather than their adoption of contrarian strategies, explains the predictive ability of their aggregate trades. Nevertheless, the behaviour of share prices in the pre-event period is consistent with the theoretical work of Cespa (2008) who shows that insiders are likely to trade on long-lived information and they control the flow of information.

The rest of the paper is structured as follows. Section 2 reviews the literature and sets up the hypotheses. Section 3 presents a discussion of our data and the methodology. Section 4 provides the empirical results, and the conclusions are in Section 5.

2. Review of the Literature and Hypotheses Tested

2.1. Review of the literature

In theory, IPOs are expected to generate positive long-term returns for a number of reasons. First, they are usually more risky than the average market, indicating a high exposure to market risk.[4] Second, the asymmetric models, particularly the signalling theories that relate the long-term performance to the first day returns, suggest that IPOs underprice on purpose to subsequently be able to sell further shares at a higher price, and as a result, the long-run returns should be high. If firms underprice to signal their high quality, they should perform better than low quality firms (Jenkinson and Ljungqvist, 2001). Similarly, Benveniste and Spindt (1989) develop a book building model under which underpricing compensates better-informed investors for truthfully revealing their information before the issue price is finalized, thus reducing the expected money left on the table. These investors may reveal a noisy signal, which indicates the direction and extent of the revision in the offer price relative to the price range, and may result in subsequent performance to correlate positively with the initial price revision.

The empirical evidence provided to date is mixed. Some studies report that IPOs underperform various benchmarks for the first few years after offering.[5] For example, Ritter and Welch (2002) show that the three-year abnormal underperformance of US IPOs listed in 1980-2001 is -23%, with -34.3% in the later period of 1999-2000. Brav and Gompers (1997) report alpha from the regressions of Fama and French (1993) of -0.49. This underperformance is also observed in other countries (e.g., Schuster (2003) in Europe, and Levis (1993, 2011), Espenlaub et al. (2000), and Goergen et al. (2007) in UK).

However, other studies show that this long-run underperformance depends on the sample period, statistical methodology, and may suffer from econometrics misspecifications. Eckbo et al (2007) report significant underperformance of IPOs relative to matched firms of -18% for industrial IPOs using equally-weighted buy and hold returns, but when value-

weighted returns are used, the difference is not significant. Similarly, Brav, Geczy and Gompers (2000), and Eckbo and Norli (2005) report insignificant differences in buy and hold returns between IPOs and size and book-to-market matched control firms. They also report insignificant alpha based on variants of Fama and French (1993) model. Ritter and Welch (2002) find underperformance of only -5.1% using the style adjusted returns methodology, but decreasing to -61.2% in 1999 to 2000. Using the Fama and French (1993) factor model, they show that the sign and significance of alpha, which measures the excess performance, depend on sample periods and on the inclusion of lagged values of the factors. Brav and Gompers (1997) find that IPOs appear to overperform relative to size, book-to-market, and Fama and French industry portfolios. However, for non-venture-backed IPOs, the Fama and French (1993) three-factor regression model results in negative alphas, particularly for small and medium sized IPOs. Brav et al. (2000) find that post-issue IPO returns are similar to those of firms with similar size and book-to-market characteristics and they co-vary with similar non-issuing firms. Levis (2011) shows that, in the UK, while the equally weighted returns are not significant, the value weighted are negative and significant and the Fama and French (1993) coefficients are also not homogeneous across the equally- and value-weighted returns. He also shows significant positive performance for private-equity backed IPOs, but negative for non-backed IPOs.

Notwithstanding the methodological issues reviewed in Fama (1998)[6] and Ritter and Welch (2002), the past literature offered a number of explanations for the long-run under-performance of IPOs. Morris (1996), Ritter (1991) and Rajan and Servaes (1997) among others, argue that with costly short selling and heterogeneous beliefs among investors at the time of the IPO, investors are over-optimistic about the growth prospects of the company, resulting in initial overpayment. Aggarwal and Rivioli (1990) argue that there are fads in the IPO market as firms go public at the time when investors are over-optimistic about growth prospects of IPOs. As a result, the most optimistic investors will determine the price in the

market. Subsequently, as more information becomes available and investor sentiment changes, they mark prices down. Ljungqvist (1996) argues that the greater the fraction of equity capital initial owners retain at floatation, the lower their incentive to take advantage of over-optimistic investors, since the value of their retained shares would fall as and when new investors become less optimistic, resulting in an increase in the long-run returns with the retention rate. Ritter (1991), Lerner (1994), Loughran and Ritter (1995, 2000), Baker and Wurgler (2000) and Hirshleifer (2001) extend these behavioural explanations and suggest that stock prices periodically deviate from fundamental values and managers and investment bankers take advantage of overpricing by selling stock to overly optimistic investors. Overall, under these arguments, the long-term returns emanate from high divergence of opinion raising the initial market price, and this disagreement declines over time, and the valuation by the marginal investor comes closer to that of the average investor.

Other studies relate the long-term returns to IPO fundamentals. For example, Eckbo et al. (2000) show that leverage is significantly reduced following equity offerings, while liquidity is increased, resulting in a reduction in risk. As a result, IPOs are less sensitive to interest and inflation shocks and require lower liquidity premium than benchmark firms, and thus, should have lower returns. Ibbotson (1975) reports a negative relation between initial returns at the IPO and the long-run share price performance. In terms of agency costs, Mikkelson et al. (1997) show that the long-run returns are unrelated to ownership structure, but Jain and Kini (1994) find a positive relation between post-IPO operating performance and equity retention by original shareholders. Other studies find that large IPOs (Brav et al., 2000), backed by venture capitalists (Brav and Gompers, 1997), or private equity firms (Levis, 2011), and underwritten by prestigious underwriters (Carter et al., 1998, Krishnan et al, 2011) underperform less, while those with wide initial spread, a late opening trade, and a high proportion of institutional flipping, have lower returns (Houge et al., 2001). Carter et al (2011) show that IPO underperformance is limited to the 1980s and early 1990s.

In terms of insider trading, previous studies document that insiders are contrarians, but focus more on the association between insider trading and subsequent stock returns. Seyhun (1986) shows that insiders are net buyers in small firms and net sellers in large firms and larger insider trades are associated with higher subsequent abnormal returns. Frankel and Li (2004) find that financial statement informativeness and analyst following reduces the impact of insider trade on subsequent returns. Lakonishok and Lee (2001) find that the impact of insider trading on stock returns is limited to small firms. Aboody and Lev (2000) use research and development (R&D) expenditure as a proxy for the information asymmetry between insiders and investors, to find a higher market reaction on the announcement date of insider trades for high R&D firms. Other studies that focus on individual insider trades also report that insider trading is informative and results in more efficient prices that reflect public as well as private information (e.g., Meulbroek (1992), Cornell and Sirri (1992) and Chakravarty and Mcconnell, 1999). However, Hubbart and Ke (2007) find only two measures of information asymmetries, R&D expenditures, and the median absolute abnormal return over past earnings announcements to affect the information content of insider trading, but not institutional ownership, analyst following, book-to-market ratio, and the frequency with which the firm reports losses. Ofek and Yermack (2000) show that stock-based compensation does not drive insider trading, and their results are consistent with portfolio rebalancing rather than the exploitation of private information. Clarke et al (2001) show that insider selling increases prior to seasoned equity offerings that are completed and cancelled, but declines afterward only for cancelled offerings, suggesting that insiders issue overvalued equity, and cancel the issue when the market reaction to the announcement eliminates the overvaluation.

As far as we know, no previous study focuses on the joint relationship between these two trends in the literature. We assess in this paper the link between insider trading and IPO long-run performance. We provide in the next section our hypotheses.

2.2. Testable Hypotheses

Overall, previous studies suggest that IPOs underperform because of high information asymmetries (Ritter and Welch, 2002). Since other studies show that insider trading conveys information, we expect such trades to mitigate the information asymmetry inherent in IPOs, and thus, to affect the long-term performance of IPOs, for a number of reasons. Insiders are likely to trade prior to information releases and/or if their company is mispriced. The former is tightly regulated, but various studies show that insiders do trade before material information is released (e.g., Korczak et al., 2010). We focus more on the second motivation as our concern is more on the long-term returns. We consider that when insiders have a higher information advantage, the abnormal return following their buy (sell) trades should be higher (lower). Given the great uncertainty about the value of their IPOs, insiders are likely to benefit from their trades if they hold perfect information, suggesting that insiders will only affect stock prices if they hold precise and credible information, and if outsides have lower information about the value of the IPO.

The second factor that might affect the impact of insider trading on the IPO performance is the level of competition in the market. Grossman and Stiglitz (1980) develop the price-taking model where individuals can trade any amount without altering the price at which the trade takes place, while Kyle (1985) shows that, under imperfect competition, insiders will influence prices. Huddart and Ke (2007) argue that, in the case of insider trading, both these models predict that higher information asymmetry leads to more positive (negative) abnormal returns following buy (sell) trades, and, thus, higher returns to insiders.

In this paper, we expand this literature in several ways. We test the hypothesis that insider trading increases stock price accuracy and discovery in the long-run by mitigating the relatively significant information asymmetries inherent in IPOs, thus leading to a more efficient long-run pricing. We use Lakonishok and Lee's (2001) net purchase ratio, NPR, defined as net purchases over total transactions, as a measure of the aggregate insider trades

in our IPOs. We expect NPR to explain further the long-run returns of IPOs. In particular, if insiders trade on private information, we expect IPOs where insiders are net sellers to generate negative returns, while IPOs where they are net buyers to have positive returns. Since insider trading cannot be predicted at the time of the IPO (Hoque and Lasfer, 2011), investors cannot separate firms on the basis of subsequent insider trading. We alleviate this shortcoming by running calendar time regressions with the 3-factor model starting from the date of the trade rather than the IPO date. We expect the alpha of the buy (sell) trade portfolios to be positive (negative) and significant. This stock price behaviour will also be consistent with the agency theory framework (Jensen and Meckling, 1976) because insider buy (sell) trades will lead to lower (higher) agency conflicts. In this case, we expect this impact to be higher in IPOs with high potential agency conflicts, i.e., those with low insider ownership (overhang, shares locked), institutional ownership, underpricing, prestigious underwriters and venture-capitalist backing.

However, long-term performance could be the cause rather than the effect of insider trading. Previous studies (e.g., Lakonishok and Lee, 2001; Jenter, 2005) assert that insiders are contrarian investors as they tend to buy (sell) after negative (positive) price performance. If the post-trade returns do not revert, then we can conclude that the long-term returns that affects insider trading, rather than the reverse. We test this causality by analysing the average cumulative returns before their trades. The UK market is ideal for such analysis as insiders are required to inform their company and the market within a maximum of five days of trading, and such announcements are immediately disclosed in the *Regulatory News Service*.[7] We, thus, expect IPOs where insiders sell (buy) to generate positive (negative) excess returns.

However, insiders may trade for other than private information reasons, such as liquidity and portfolio rebalancing considerations. In IPOs, they could also trade after lockup expiry date, but this will apply to only sell, not buy, trades. In this case, we expect weak or no relationship between insider trading and the long-run returns of IPOs.

3. Data and Methodology

We first gather the list of IPOs that went public in the London Stock Exchange, (LSE), in both the Main market and the Alternative Investment Market (AIM), a relatively less regulated market for smaller and younger companies, between January 1999 and 2006 from the LSE website. We find 1,117 IPOs. We use the LSE database to collect data on the quotation market (AIM or Main market), admission date, country of incorporation, issue price, market value, money raised, name of the broker, and for AIM IPOs, the advisor. We then download all prospectuses from *Perfect Filings* database and hand-collect all information relating to lockup arrangements, including lockup dates, percentage of shares locked-up, fraction of insider shares locked up, directors' ownership before and after the IPO, percentage sold at the time of the IPO, institutional ownership, and venture capital backing. We extract any delisting dates, other accounting, and stock market data, which include daily stock prices and indices to compute the stock returns, market capitalization, which we use as proxy for size, accounting return on assets to measure profitability, and price-to-book ratio to proxy for growth from *DataStream*. We exclude 77 IPOs for which we could not find the prospectuses, 15 with missing share price data, and 195 with no lockup date or ownership data from the prospectuses. Our final sample includes 830 (74%) firms with complete data. We obtain information on subsequent raising capital in the form of seasoned equity issues (SEOs) from London Stock Exchange, and then match it with our IPO sample to determine how many IPO firms raise more capital within three years of IPOs. We also obtain M&A announcement information from Thomson One Banker database. Then we match the M&A sample with out IPO data to determine how many of them occur during three years of IPOs.

Finally, we use a Fifth database, *Directors' Deals*, which records all the trades undertaken by insiders in the UK market. The database includes news items on directors' trades disclosed by all UK firms in the Regulatory News Service (RNS), such as transaction

price, amount, and value, post-transaction holding, change in holding, name and position of the insider, and announcement and transaction dates. We exclude a number of observations not related to private information, such as exercise of options or derivatives, script dividends, bonus shares, rights issues, awards made to directors under incentive plans or reinvestment plans. We also exclude all directors' transactions in investment companies. After this screening, we obtain 36,943 insiders' trades from the UK market. We check the data for errors and exclude 2,952 (8%) trades as the difference in announcement and transaction date is more than 5 days, the UK legal requirement (Korczak et al., 2010). Our final sample includes 33,991 directors' trades in 2,664 listed companies, split into 26,268 (77%) buy, and 7,723 (23%) sell trades. We, then, match all insider trading event dates with the dates of the IPOs, and select all IPOs where insider trading occurs during the three-year period of IPO. We find 287 firms without insider trading (35%) and 543 (65%) firms with at least one insider trade during the 36 months period after IPO. We exclude 31 trades that occur on the same day. We identify 791 sell trades in 231 IPOs and 2,102 buy trades in 480 IPOs. Finally, we follow Lakonishok and Lee (2001) and define the *Net Purchases Ratio, NPR*, as:

$$NPR = \frac{Purchases - Sells}{Total\ Trades}$$

We find 190 (35%) IPOs with negative *NPR*, referred to as *Net Sell* sub-sample, and 353 (65%) with positive NPR, classified as *Net Buy* sub-sample. We use both number of transactions, *NPR transaction*, and value of the trades, *NPR value*. Overall, we expect insiders to be net buyers in over-performing and net sellers in underperforming IPOs.

We use various methodologies to test our hypotheses. We first use the standard event study methodology to compute the cumulative abnormal returns over 3 years after the first month of the IPO. The abnormal returns are the monthly returns on each IPO *less* the return on the *Financial Times All Share Index*, FTA, which is a more representative index as it includes small as well as large companies. We also use the AIM index for our AIM IPOs, and

FTA for IPOs on the main market, and compute both the equally- and value-weighted CARs. We also compute the style-adjusted CARs, and buy and hold returns, BHARs, following Ritter and Welch (2002), as the difference between the returns on an IPO and a style-matched firm, defined as the closest market capitalization and book-to-market ratio listed firm to our IPO. We select the control firm only once, and if it is delisted prior to the IPO returns' ending date, we replace it with another matching firm on a point-forward basis. If the IPO is delisted, we compute the excess returns up to the date of delisting. We also use the market model to compute the abnormal returns over the event window [-40, +40] relative to the trading date, and the lockup expiry date. The α and β are from the regression of the security returns against the corresponding market indices, the AIM all share price[8] and FTA, for AIM and main market IPOs, respectively, over the period [-290, -41] trading days relative to each event date. Finally, we estimate the Fama-French (1993) calendar time regressions, using Ritter and Welch (2002) approach:

$$R_{pt} - R_{ft} = \alpha + \beta_t (R_{Mt} - R_{ft}) + \beta_{t-1} (R_{Mt-1} - R_{ft-1}) + \gamma_t SMB_t + \gamma_{t-1} SMB_{t-1} + \delta_t HML_t + \delta_{t-1} HML_{t-1} + \varepsilon_{pt}$$

where $R_{pt} - R_{ft}$ is the excess return over the risk free rate on a portfolio in time period t, $R_{Mt} - R_{ft}$ is the market risk premium, with FTA as a proxy for R_{Mt}, and R_{ft} the 3 months Treasury bill rate. SMB_t is the return on small firms minus the return on large firms, and HML_t is the return on high book-to-market return minus the return of the low book-to-market portfolio. We extract the relevant data for size and book-to-market indices from K. French data library: http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html#International. We compute β of our firms as the sum of β_t and β_{t-1}. We use similar method to assess our firm's exposures to SMB and HML factors. Under the signalling and agency theory hypotheses, we expect $\alpha_{Net\ Buy}$ to be higher than $\alpha_{Net\ Sell}$.

We also relate *CARs* to *NPR* after controlling for other factors defined in the previous literature, such as first day return, size, insider ownership (overhang), the underwriter reputation, venture capitalist backing, abnormal returns on the lockup expiry dates, lockup length, period dummies, and Seasoned Equity Offerings (SEO) to capture Myers and Majluf (1984) effects. In addition to the direct proxy for the actual takeover obtained from Thomson One Banker database, as discussed above, we follow Brar et al (2008) and define the takeover probability as follows. We first build a two-way matrix by size and growth in turnover. We consider that large and high growth firms are less likely to be subject to a takeover bid, and thus assigned a value of zero. In contrast, those in small and low growth quadrant have a higher probability of a takeover, and we assign them a value of one. We then classify firms in the remaining two quadrants into yield groups: high yield IPOs have a higher probability, and, thus take a value of one, while those with low yield have a value of zero.

Finally, we run logit regressions to determine the characteristics of the *Net Sell* and *Net Buy* subsamples. In the first regression, the dependent variable is equal to one if IPO is in *Net Sell* sub-sample, and zero for *No Trade*. We next compare *Net Buy* and *No Trade* sub-samples. The last regression compares the *Net Sell* and *Net Buy* sub-samples. We use various explanatory variables to capture the IPO fundamentals. We use size, as measured by the log of market value of equity at the IPO date, to assess whether insider trading occurs in large, thus, less risky firms. In addition, we include risk, as measured by the standard deviation of the stock returns over the 36-months period, and first day underpricing. We use market-to-book ratio, and $CAR_{-40,-2}$ relative to trading dates, to assess whether insiders are contrarians. We measure insider ownership structures using overhang, shares locked, and lockup lengths. We also account for ownership of outsiders, including VC backing, and institutional holding. Finally, we use takeover and SEO probabilities, to assess trading on insider information and prestigious underwriters to evaluate the impact of corporate brokers in the UK.

4. Empirical Results

4.1. Descriptive Statistics

Table 1 provides the descriptive statistics of our sample firms. Panel A. reports the mean, median, and 10th and 90th percentiles of a set of fundamental variables. The results show that the average (median) length of the lockup is 391 (365) days, in line with Espenlaub et al (2001) and Hoque and Lasfer (2011),[9] and more than double that in the US, where, for example, Brav and Gompers (2003) and Field and Hanka (2001) find median of 180 days. Our IPOs offered 38.6% (32.9%) of their shares in the market, the mean (median) shares locked amounts to 29.5% (24%) of the shares outstanding, and the level of underpricing of 22.5 % (9.5%) is consistent with previous evidence (e.g., Chambers and Dimson, 2009). The analysis of the fundamentals indicates that, while the average market value of equity of our firms is £140m (about $210m), our sample includes small as well as large firms. Consistent with US evidence (e.g., Brav and Gompers, 2003), our IPOs are loss making as the average (median) return on equity is -34.6% (-2.6%) and high growth as the average (median) market-to-book ratio is 3.88 (3.01).

Panels B and C report the distribution of the buy and sell trades during the three-year post-IPO period. On average, there are 3.56 sell and 4.38 buy trades, occurring roughly 1.5 years after IPO, suggesting that most of the trades occur after the lockup expiration date. The results indicate, however, that the number and value of shares sold are significantly higher than the buy trades; the value of shares sold of £2.3m is 10 times those bought of £0.23m. We also observe this difference (1.01% vs. 0.21%) when we scale the value of the trades by market capitalisation to account for size impact, as the average market value of IPOs subject to buy trades of £248m is significantly lower than the £538m for the sell trade IPOs. Overall, the buy trades are more frequent, but they are significantly smaller than the sell trades. Consequently, the average holding of insiders is significantly larger in IPOs with sell trades.

Panel E reports the annual distribution of sample IPOs and the lockup lengths. Consistent with previous evidence (e.g., Chambers and Dimson, 2009), the volume of IPOs is relatively high in the 'Bubble' periods of 2000, and 2004-2006, but 2001-2003 is a relatively quiet period. The next row reports the distribution of the amount of money raised. IPOs appear to be relatively larger in 1999 to 2000 period, with an average of £200m per issue, compared to £88m in the post-2001 period. In terms of the length of the lockup, the results show that the maximum of 437 days is in 2002 and the minimum of 374 is in 2000. However, we note that the distribution is relatively homogeneous, and in each year, the average is higher than 180 days documented in the US. The most interesting results relate to the annual distribution of insider trades and the *Net Sell* and the *Net Buy* sub-samples, reported in the last two rows. In total, there are 791 sell trades undertaken in 231 IPOs and 2,102 buy trades in 480 IPOs. The results indicate that both the buy and sell trades are more frequent in 2004-2006, except for the 19% buy trades in 2000. In 1999, the total number of trades is 122, split into 79 (4% of 2,102) buy and 43 (5% of 791) sell trades, while the respective trades in 2005 are 715, 475, and 240. We find a relatively similar frequency distribution when we analyse the number of *Net Buy* and *Net Sell* IPOs. The frequency of both sub-samples peaked in 2004-2005 and declined slightly in 2006. During 1999-2003, only a small number of IPOs are subject to insider trading activity, with the exception of the 166 IPOs (20%) in 2000. We account for this time effect in our regressions.

[Insert Table 1 here]

4.2. The long-run performance of IPOs

Table 2 reports the long-run performance over various sub-periods after the IPO date. We first report in Panel A. the raw buy and hold average returns (BHARs). However, Brav, Geczy and Gompers (2000) argue that tests of underperformance based on buy-and-hold returns are biased towards rejecting the null hypothesis of no underperformance. Moreover,

the raw equally-weighted returns may result in biased long-term returns as they are not compared to a benchmark and they may suffer from size effects. Furthermore, previous studies using matching firm approach find that the underperformance disappears (e.g., Brav and Gompers, 1997) or, at least, it shrinks (e.g., Ritter and Welch, 2002). We account for these potential biases by reporting, following Ritter and Welch (2002), in Panel B and Panel C the style adjusted BHARs and cumulative abnormal returns (CARs) where the style-matched firm is the closest market capitalization and book-to-market ratio listed firm. In Panel D and Panel E we compare equally weighted and value weighted CARs with $\alpha = 0$ and $\beta = 1$. Finally, the last column of Table 2 reports the cumulative abnormal returns over months 2 to 18, and 19 to 36 as Figure 2 shows that the periodicity of the 2,102 buy trades and 791 sell trades are relatively evenly distributed cross these two sub-periods.

[Insert Figure 1 here]

Our results are relatively consistent across these different methodologies. Overall, they indicate that the excess returns are not homogeneous across our sample firms. In particular, the overall underperformance of our sample of IPOs appears to be driven by IPOs without insider trading and *Net Buy* IPOs which underperform consistently across all our sample period except the first few months of quotation, while Net Sell IPOs over-perform. For example, the style-adjusted buy and hold excess returns (BHAR) reported in Panel B in months 19 to 36 amount to -22.6% and -20.4% for the sample as a whole and *Net Buy* IPOs, respectively, but -43.8% for IPOs with no insider trading. In contrast, the *Net Sell* IPOs generate positive returns throughout the sample period, except the first month. We show these results in Figure 1. Overall, our results suggest that these trades are less likely to be informative, insiders are not trading on insider information, but they are likely to sell when their IPOs reached their peak, and/or to stop the positive performance of their firms.

[Insert Table 2 and Figure 2 here]

4.3. The timing of the excess returns

In this section, we assess whether the positive (negative) excess returns of *Net Sell* (*Net Buy*) IPOs occur before or after the trades of insiders. We assess directly the market reaction around each individual buy and sell trade undertaken by insiders. Table 3, Panel A, shows that on the announcement date of buy trades, share prices increase substantially by 3.59%, compared to the 1.16% reported by Fidrmuc et. al. (2006) for UK seasoned firms. In the various pre-event periods, the CARs are all negative and significant, suggesting that the trades occur when the IPO is underperforming. Interestingly, the post-event CARs are all negative, suggesting that the positive signal of the buy trades is short-lived. For the sell trades, the pre-event period CARs are positive and highly significant, but on the event and post-event periods, they are not constantly negative and significant. These results suggest that, consistent with previous insider trading literature (e.g., Seyhun, 1986), insiders adopt contrarian strategies by buying (selling) after significant share price decreases (increases), but the informativeness of these trades is weak, as stock prices do not increase (decrease) after their buy (sell) trades. Although the negative announcement dates abnormal returns implies that by selling shares insiders convey bad new to the market, in line with Brau and Fawcett (2006), the impact is short lived. Our results also imply that since the returns in the period before the sell trades are positive, insiders may have stopped the positive performance of the IPO. Without such trades, returns may have carried on increasing, although they are small.

In Panel B, we aggregate these trades for *Net Buy* and *Net Sell* sub-samples. The CARs for *Net Buy* sub-sample are all negative and significant, with the exception of the positive returns of 2.60% on the announcement dates. In contrast, for the *Net Sell* sample, the CARs are all positive, except for $CAR_{-1,+1}$ and $CAR_{+2,+40}$. However, the pre-trade CARs are relatively larger than the post-trade CARs, suggesting that, in line with the last two columns in Table 2, the pre-trade period is likely to drive the excess returns for the *Net Sell* sample.

[Insert Table 3 here]

4.4. Fama and French (1993) Results

We expand our robustness checks using the Fama-French (1993) regressions model. In line with Table 2, we tested for robustness using various measures of excess returns. We report only a subset of these results as they are relatively similar. Table 4, Panel A, reports the results based on equally weighted returns. For the sample as a whole, α is negative and significant and amounts to about -0.9% per month, equivalent to $CAR_{1, 36}$ of -36% reported in Panel A, Table 2. Interestingly, β, the sum of β_t and β_{t-1} is 1.66, in line with Ritter and Welch (2002) findings of 1.73. This magnitude of β is relatively homogeneous across all our sub-samples, ranging between 1.45 for *Net Buy* and 1.66 for *Net Sell* samples. These results suggest that IPOs have relatively higher risk and, therefore, they should generate positive long-term returns. The results indicate that α is negative and significant for *No Trade* and *Net Buy* IPOs. On the other hand, α of *Net Sell* IPOs is constantly positive and significant, reflecting the relative overperformance of these IPOs, in line with our findings in Table 2.

The remaining results show that the coefficients of SMB across all the subsamples are relatively identical, and the lagged coefficients are predominantly insignificant. Similarly, the coefficients of the lagged HML are not significant, but the coefficient of HML is more negative for the *Net Sell* IPOs. The results based on value-weighted returns in Panel B, are relatively similar. While α is not significant for the All IPOs, and *No Trade* IPOs, it becomes positive and significant for *Net Sell* and negative and significant for *Net Buy* IPOs.

Our results so far may suffer from the look-ahead bias, because investors could not separate IPOs on the basis of subsequent insider trading at the time of the IPO. Such trading cannot be predicted even during the lockup period (Hoque and Lasfer, 2011). We, therefore, assess the excess returns from the date of the buy and sell trades, rather than IPO date, to allow investors to trade on such information. We run the Calendar time portfolio regressions. The results in Table 4, Panel C, show that alpha is negative for buy but positive for sell

trades, confirming that insiders earn negative returns on their purchases, but shares prices do not decrease after sell trades, in line with the results in Panel A and Panel B.

[Insert Table 4 here]

4.5. The determinants of the long-run performance

The previous section indicates that insider trading affects significantly the long-run performance of IPOs as *Net Sell* (*Net Buy*) IPOs generate positive (negative) excess returns. In this section, we expand these results by running a set of regressions to assess whether this difference in performance holds after controlling for IPO fundamentals. Table 5 reports the cross sectional regressions results. Regressions (1-3) are with bubble and hot market dummies and regressions (4-6) are with year dummies. As a measure of insider trading activity in the IPOs we use net purchase ratio (based on number of transactions and value) and a dummy variable for no insider trading. The last three columns replicate Regression (1) for *Net Buy*, *Net Sell* and *No Trade* subsamples. Interestingly, all the three insider-trading variables affect negatively the long-term performance. The negative coefficient of *NPR* implies that IPOs where insiders are net buyers generate negative returns. Similarly, *No Trade* dummy is negative and significant, suggesting that IPOs not subject to insider trading underperform significantly more than their counterparts where insiders trade. These insider trading variables have also increased the explanatory power of the regressions as previous studies report relatively much lower R^2 of 1 to 8% (e.g., Levis, 2011; Goergen, Khurshed and Mudambi, 2007).[10] Overall, our results suggest that insider trading is an additional and significant explanatory variable of the long-run performance of IPOs.

The remaining explanatory variables expand the findings reported in previous studies. For example, the relationship between long-run performance and *Underpricing* is negative and significant in all our specifications, except in the *Net Sell* subsample, in line with previous evidence (e.g., Levis, 2011), suggesting that IPOs with high first day returns

generate lower long-term returns, in contrast to the predictions of the signalling models (Jenkinson and Ljungqvist, 2001). The variable *Overhang* is significant in (3) to (5), but not in (6) and in the subsample IPOs. The results also indicate that *Prestigious Underwriters* and the *Venture Capitalists* do not affect performance, in line with Levis (2011), but in contrast to Krishnan et al (2011). *Size* is negative, but not significant, in contrast to Brav and Gompers (1997) who show that underperformance is concentrated in small, non-venture capitalists-backed firms. We also find a positive relationship between long-term returns and the lockup expiry dates excess returns, suggesting that IPOs with high abnormal returns on the lockup expiry dates are more likely to have higher long-term returns, as insider are unlikely to have sold their holdings after the lockup, and, thus, lower agency conflicts. In addition, the *Lockup Length*, *High Tech*, *Bubble* and *Hot market* dummies, affect negatively the long-term returns. Levis (2011) report a negative, but not significant, coefficient for bubble dummy.

[Insert Table 5 here]

4.6 The determinants of insider trading in IPOs

The results in the previous sections highlight the controversy that IPOs where insiders sell perform better that those where they buy. In this section, we expand this analysis by assessing the likelihood of insider trading through univariate analysis, and by running a set of logit regressions, in line with Hoque and Lasfer (2011) who focus on trading during the lockup period. We contrast further the fundamental characteristics of IPOs in three different samples: *Net Sell* vs. *No Trade*, *Net Buy* vs. *No Trade*, and *Net Buy* vs. *Net Sell*. Previous studies consider that insiders trade for information and non-information reasons. While the latter relate to liquidity and portfolio diversification, the former states that insiders are likely to trade to take advantage of their foreknowledge of a particular major news announcement or that they consider that their firm is mispriced in the market. Under the non-information motive, the post-trade stock prices are likely to be random, but when they trade on private

information, the excess stock returns on and after the trades should be significant. The overwhelming past evidence finds that insiders do trade on private information (e.g., Seyhun, 1986; Korczak et al., 2010). The question is whether they trade shortly before news announcements and violate insider trading rules, with potential regulatory scrutiny and litigation, as well as potential political and reputational costs,[11] or whether the abnormal returns reflect insiders' superior knowledge about their firms' prospects, and their ability to recognize pricing errors made by outside investors. In this later case, insiders are expected to trade against the market sentiments.

We use SEO dummy and takeover dummy to proxy for trading on news releases. Trading on mispricing suggests that insider know the value of their company and, as a result, they tend to adopt contrarian strategies by buying (selling) stocks with poor (good) past performance (e.g., Jenter, 2005; Lakonishok and Lee, 2001). To capture this effect, we use the cumulative abnormal return 40 days before the trading dates, $CAR_{-40,-2}$, and market-to-book ratio, to assess whether insiders buy a stock when it is selling at a low valuation, and sell it when it has a high valuation over a longer horizon.

However, other fundamental factors are also likely to affect such strategies. While Peress (2010) reports that firm size affects trading propensity, Seyhun (1986) finds that insiders are more likely to buy in small and sell in large firms. We use the natural logarithm of market capitalization, defined as the IPO offer price *times* the number of shares offered. In addition, previous studies also identified ownership as an additional factor that might affect the propensity of insiders to trade. For example, Ofek and Yermack (2000) report that executives with large shareholdings sell stock after receiving new equity incentives to diversify their portfolios. We use shares locked, the lockup length, and the ratio of shares retained to shares sold, *Overhang*, to account for this potential effect. We control for outside ownership by including in our regressions institutional ownership and venture-capital backing. Finally, trading strategies are risky, and Meulbroek (2000) finds that managers in

more risky companies tend to sell equity more aggressively. We use *Underpricing* as a measure of risk. Previous studies report that risky IPOs are underpriced more (see Ljungqvist (2007) for a review). Finally, we use *Prestigious Underwriters* to measure the power of underwriters in the UK to initiate the trades,[12] and market conditions.[13]

Table 6 reports the univariate analysis. The first column reports the results for all IPOs with insider trading. Compared to *No Trade* sample, the results show that insiders are more likely to trade in IPOs with low underpricing, standard deviation of returns, and market–to-book, underwritten by prestigious underwriters, and backed by venture capitalists. These IPOs also generate higher returns before the trade and on the lockup expiry date, are high technology firms, but less likely to be issued in bubble period, and to be subject to a takeover. These results appear to suggest that insiders are likely to trade in low risk IPOs. Interestingly, the results also suggest that prestigious underwriters and venture capitalists affect insider trading positively. Finally, consistent with the proposition that insiders do not trade on private information, the probability of insider trading is significantly lower in the IPOs with high takeover probability.

We then focus on differences between *Net Sell*, *Net Buy*, and *No Trade* samples. The results indicate that *Net Sell* IPOs have lower lockup lengths and risk, more likely to be underwritten by prestigious underwriters, higher pre-trade returns and lockup expiry returns, less likely to be issued in bubble and hot periods, and less likely to be taken over than *Net Buy* and *No Trade* sub-samples. In addition, they have lower underpricing and fraction of shares locked, and less likely to be backed by venture capitalists, than the *No Trade* IPOs, but a higher risk than *Net Buy* IPOs. Compared to the *No Trade* IPOs, the *Net Buy* IPOs are more likely to be underwritten by prestigious underwriters and backed by venture capitalists, more likely to be high tech but less likely to be issued in hot period or to be taken over. They also generate relatively higher returns before the trades, $CAR_{(-40,-2)}$, but they have low market-to-book ratio, suggesting that they are likely to be undervalued. These results suggest that

insiders sell in IPOs with relatively shorter lockup lengths and a smaller proportion of shares locked, but they appear do undertake their trades after the lockup expiry date, as the abnormal returns on that date are significantly lower than the remaining IPOs. In addition, they have the best underwriters, have low risk and generate highest returns, suggesting that the underwriters are likely to be happy for them to sell, as the usual negative signal of sell trades is likely to be small. In contrast, the *Net Buy* IPOs have strong underwriters, but more risky and generate low returns before the trade and their low market-to-book ratio suggest that they are undervalued. These results imply that insiders buy stocks probably to support the decrease in price. Contrary to Seyhun (1986), our results do not suggest that insider buy in small IPOs.

Panel B reports the distribution of *Underpricing*, *CARs* (36 months equal weighted), and the proportion of *Net Buy* and *Net Sell* IPOs, by fundamental factors. The results indicate that underpricing is higher in large firms, in line with Brav and Gompers (2003) and Levis (2011), and in IPOs issued in the bubble period, but it is lower in IPOs underwritten by prestigious underwriters and not affected by institutional holding, venture capitalists backing, market of quotation, and hot period. The results for the long-term returns (*CARs*) are relatively similar, except that prestigious underwriters is not a factor, but IPOs issued in hot period have lower long-run returns. The last two columns provide additional analysis of our IPOs in the *Net Buy* and *Net Sell* subsamples. The results indicate that insider trading in both the *Net Buy* and *Net Sell* IPOs occur mainly in larger firms, and that *Net Sell* IPOs are likely to be underwritten by prestigious underwriters, backed by venture capitalists, and quoted in the main market, but less likely to be issued in bubble period and in cold market. In contrast, *Net Buy* IPOs are relatively homogeneously distributed across these characteristics, but unlike *Net Sell* IPOs, they appear to occur more in IPOs quoted on AIM than on the Main Market.

[Insert Table 6 here]

Table 7 reports the logit results. All regressions include year dummies.[14] For each group, we run two regressions to account for any multicollinearity, particularly between *Size* and *Prestigious Underwriters*. In equation (1) and (2), we assess the probability that insiders are net sellers by comparing *Net Sell* IPOs, set equal to 1, against *No Trade* IPOs, equal to 0. The results indicate that the pre-trade stock price performance affect significantly the decision to sell rather than not to trade, in line with previous insider trading literature (e.g., Seyhun, 1986; Korczak et al., 2010). The positive and significant coefficient of $CAR_{(-40,-2)}$ suggests that insiders sell in IPOs with significant increase in share prices, 38 trading days before the trade. These results are consistent with the notion that insiders adopt contrarian strategies in their sell trades. However, they appear to suggest that insiders are more concerned with the short-term run up in share prices rather than the long-term valuation of their IPO, as the coefficient of market to book, *MB*, is not significant. Insiders are also more likely to sell in large firms, and those backed by venture capitalists. Although these results suggest that insiders sell in less risky firms, the coefficient of the standard deviation of returns, σ, is negative and not significant. The coefficient of the takeover probability is negative and significant, suggesting that insiders are less likely to sell on private information for fear of litigation, political and reputational risks. In Equation (2), we report the results based on non-correlated variables, which are relatively similar, except that the coefficient of *Prestigious Underwriters* is now positive and significant.

Equations (3) and (4) report the results of *Net Buy*, relative to *No Trade*. Interestingly, while the coefficient of CAR is not significant, that of market to book, *MB*, is negative and significant, consistent with Lakonishok and Lee (2001) and Jenter (2005), and suggesting that insiders buy stocks if they consider that their firm is undervalued in the long- not short-run. In addition, unlike *Net Sell* IPOs, firm size is positive but not significant. However, in line with the first two columns, the results indicate that insiders are less likely to buy when the probability of a takeover is high, probably to comply with the legal requirements.

Equations (5) and (6) report the probability of *Net Buy* vs. *Net Sell*. The results are relatively similar to the univariate findings in Table 5. In particular, the $CAR_{(-40,-2)}$ of *Net Buy* IPOs are significantly lower than those of *Net Sell* IPOs, confirming the contrarian strategies adopted by insiders. *Net Buy* IPOs are also smaller than *Net Sell* IPOs. Surprisingly, insiders in these IPOs have already a large proportion of their holdings locked and the lockup length is significantly longer than the *Net Sell* IPOs. The remaining variables are relatively similar across the two samples.

Finally, Equation (7) reports the multivariate logit regression results where the dependent variable is equal to 2 for *Net Sell*, 1 for *Net Buy*, and 0 for *No Trade* IPOs. The results show that the pre-trade CARs are positive and significant, suggesting that these CARs are significantly higher for the *Net Sell* IPOs. These IPOs are also more likely to be backed by venture capitalists, and to be significantly larger than the other IPOs. In contrast, they have lower proportion of shares locked, lower probability of takeover and market-to-book ratio.

[Insert Table 7 here]

5. Conclusion

We find strong relationship between insider trading and the long-run returns of IPOs. As far as we are aware, our paper is unique, as previous studies did not consider these two issues simultaneously. We show that UK IPOs underperform in the long-run, in line with previous UK and international studies, but those where insiders are net sellers generate substantial positive returns of 23.9% excess returns relative to size, and book-to-market matched firms, and their Fama and French (1993) alpha coefficients are constantly positive. In contrast, IPOs where insiders are net buyers and/or are not subject to insider trading have negative returns. Our results hold when we use the event study methodology to analyse short-term returns and the various methodologies to assess long-term returns, and when we account for all other factors that might affect the long-term returns in regression settings.

Our results may be consistent with the disposition effect developed in the behavioural finance literature, and they may also reflect the valuation uncertainty underlying IPOs. Since the excess returns are not negative after the sell trades, but they are negative in both the pre- and post-buy trade periods, our results imply that, unlike seasoned firms, the signalling role of insider trading in the case of IPOs is weak and that insiders time their trades and sell when they know that their IPO reached its peak, with no excess returns remaining, while they buy to support the price but the market does not value positively such trades. Our results suggest that in the context of IPOs, the signal of insiders is not likely to be too precise as the level of uncertainty in the marketplace regarding the value of the IPO is high. As a result there is no transfer of wealth from uninformed to informed investors. We also show that insider trading in IPOs is less likely to be driven by portfolio risk diversification as the propensity to trade is not affected by firm's risk, the buy (sell) trades do not necessary occur in small (large) firms, and that insider trading propensity is not affected by managerial ownership, unlike previous evidence of Meulbroek (2000), Seyhun (1986) and Ofek and Yermack (2000), respectively. However, we are unable to assess further the disposition effect explanation because of lack of data and appropriate methodology. The data is also not available to assess further the information content of insider trading, the trading of insiders before news announcements, as in Korczak et al (2010), the impact of private equity-backed IPOs, as in Levis (2011), and the direct link between corporate brokers in the UK and trading by insiders, and the trading by insiders in the derivatives market to avoid the potential scrutiny by the regulators. The extent to which these factors will strengthen or alter our conclusions is a subject of further research.

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Table 1
Descriptive Statistics of IPOs and Insider Trading

The sample includes 830 IPOs from 1999 to 2006. *Lockup length* is lockup period in days, *Shares locked* is the ratio of shares locked to shares outstanding, *Underpricing* is the percent return on the first day from the offer price to the closing price, *Market value* is the offer price *times* shares outstanding in 2008 millions of Pound Sterling constant terms. *Market-to-book* is the ratio of market capitalization at the IPO divided by the book value of the equity in the first reporting period after IPO, *Return on assets* is the net income divided by total assets in the first reporting period after the IPO. Panel B and C report the distribution of the buy and sell trades that occurred within 3 years of IPO. *Percentage Holding* is the percent of total shares owned by the director who traded. $CAR_{-42,-2}$ is the cumulative abnormal return 40 day pre-event window, where the abnormal returns are based on the standard event study methodology with α and β computed from a regression of stock returns on the FTSE All Share Price Index for main market companies and AIM All Share Price Index for AIM companies. In Panel E, *Net Buy* (*Net Sell*) is the proportion of IPOs with positive (negative) ratio of (Buys – Sells)/Total trade, *Average Money Raised* is the ratio of money raised in 2008 £m over the number of IPOs

	10th Percentile	*Median*	*Mean*	*90th Percentile*
Panel A. Descriptive Statistics of IPOs Fundamentals, N = 830 IPOs				
Lockup length	306	365	391	548
Shares locked (%)	1.50	24.00	29.40	68.00
Underpricing (%)	-1.50	9.90	22.50	51.30
Market value of equity(2008 £m)	3.20	21.60	140.20	204.10
Market-to-book	0.88	3.01	3.88	11.15
Return on Assets	-52.6	-2.60	-34.60	11.10
Panel B: Descriptive Statistics of the Sell Trades, N = 791 in 231 IPOs				
No of trades	1.00	2.00	3.56	8.00
Trade time after IPO(years)	0.52	1.45	1.52	2.63
No of Shares (000)	19.51	200.00	858.94	1,590.00
Value of shares (2008 £000)	24.24	298.57	2,334.45	2,940.68
Trade as % of market value	0.02	0.29	1.01	2.37
Percentage Holding	0.04	1.35	7.14	22.44
Market capitalization (£m)	9.00	112.35	537.60	1244.42
Panel C: Descriptive Statistics of the Buy Trades, N = 2102 in 480 IPOs				
No of trades	1.00	3.00	4.38	9.10
Trade time after IPO(years)	0.41	1.45	1.46	2.61
No of Shares (000)	5.00	27.00	172.88	250.00
Value of shares(2008 £000)	2.81	13.30	231.61	99.14
Trade as % of market value	0.005	0.05	0.21	0.41
Percentage Holding	0.01	0.63	5.27	15.65
Market capitalization (£m)	3.84	26.48	248.14	352.89

Panel E. Annual distribution of the sample IPOs and insider trades								
Year	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*
IPOs	39	144	59	44	39	159	201	146
Average money raised (£m)	187.2	253.5	106.8	84.1	100.0	51.6	73.6	138.4
Lockup length	427	374	410	437	404	392	388	375
Buy Trades (%)	4	19	8	7	6	22	23	12
Sell Trades (%)	5	8	8	6	6	27	29	11
Net Buy (% IPO)	2	20	7	5	6	20	23	17
Net Sell (% IPO)	7	8	11	6	6	25	25	13

Table 2
Long-run IPO Performance

The abnormal returns are based on the FTSE All Share Price Index for main market IPOs and AIM All Share Price Index for AIM IPOs. Panels B and C report the style-adjusted (M/B and size) buy and hold returns and CARs. *All IPOs* includes 830 UK IPOs over the period 1999-2006. IPOs with insider trades (543 IPOs) include any IPOs with at least one insider trade during 36 months period after IPO. *No Trade* (287 IPOs) include IPOs without any insider trading during 36 months period after IPO. IPOs with positive (negative) *NPR* are classified as *Net Buy* (*Net Sell*), where *NPR* is the difference between total value of purchases and sells divided by total value of shares traded over this 36 months period after IPO. We identify 190 *Net Sell* IPOs and 353 *Net Buy* IPOs. The returns exclude first day returns. ***, **,* significant at 0.01, 0.05 and 0.10 level, respectively.

	Months					Event windows	
	1	6	12	24	36	2-18	19-36
Panel A. Raw BHARs							
all IPOs	0.003	0.005	-0.037	-0.130***	-0.215***	-0.051	-0.158***
	(0.51)	(0.18)	(-1.43)	(-4.06)	(-5.38)	(-1.63)	(-6.40)
IPOs with	0.013*	0.023	0.024	0.005	-0.075	0.065	-0.111***
insider trading	(1.66)	(1.09)	(0.77)	(0.11)	(-1.33)	(1.53)	(-3.61)
No trade IPOs	-0.015	-0.030	-0.152***	-0.384***	-0.479***	-0.271***	-0.247***
	(-1.31)	(-0.48)	(-3.44)	(-11.28)	(-11.91)	(-7.03)	(-6.02)
Net buy IPOs	0.017	-0.039**	-0.123***	-0.240***	-0.331***	-0.142***	-0.209***
	(1.60)	(-1.84)	(-4.18)	(-5.47)	(-7.55)	(-3.46)	(-6.44)
Net sell IPOs	0.005	0.139***	0.298***	0.460***	0.401***	0.451***	0.071
	(0.51)	(3.12)	(4.49)	(5.22)	(3.04)	(5.09)	(1.15)
Panel B. Style-adjusted BHARs							
All IPOs	-0.002	-0.016	-0.076***	-0.139***	-0.183***	-0.055	-0.226***
	(0.27)	(-0.50)	(-2.02)	(-3.15)	(-3.43)	(-1.36)	(-2.62)
IPOs with	0.009	-0.011	-0.046	-0.033	-0.088	0.038	-0.113***
insider trading	(0.88)	(-0.38)	(-0.93)	(-0.55)	(-1.22)	(0.71)	(-2.39)
No trade IPOs	-0.023	-0.024	-0.133***	-0.340***	-0.361***	-0.229***	-0.438**
	(-1.46)	(-0.34)	(-2.38)	(-5.55)	(-5.26)	(-3.96)	(-1.89)
Net buy IPOs	0.012	-0.086***	-0.185***	-0.277***	-0.336***	-0.152***	-0.204***
	(0.93)	(-2.28)	(-2.95)	(-4.09)	(-4.50)	(-2.55)	(-3.49)
Net Sell IPOs	0.001	0.127***	0.212***	0.421***	0.371***	0.390***	0.055
	(0.11)	(2.89)	(2.75)	(4.08)	(2.49)	(3.95)	(0.70)
Panel C. Style-adjusted CARs							
All IPOs	0.022*	-0.002	-0.056	-0.175***	-0.261***	-0.123**	-0.161***
	(1.89)	(-0.05)	(-1.37)	(3.05)	(-3.72)	(-2.54)	(-3.23)
IPOs with	0.026**	0.022	-0.006	-0.073	-0.157**	-0.041	-0.143**
Insider Trading	(2.24)	(0.77)	(-0.16)	(-1.27)	(-2.23)	(-0.84)	(-2.87)
No Trade IPOs	0.012	-0.058**	-0.274**	-0.420***	-0.513***	-0.321***	-0.204***
	(1.02)	(-2.04)	(-6.76)	(-7.32)	(-7.30)	(-6.64)	(-4.10)
Net buy IPOs	0.026**	-0.017	-0.107**	-0.280***	-0.420***	-0.192***	-0.253***
	(2.19)	(-0.61)	(-2.64)	(-4.88)	(-5.97)	(-3.98)	(-5.10)
Net sell IPOs	0.027**	0.082**	0.145***	0.239***	0.239***	0.187***	0.024
	(2.33)	(2.85)	(3.45)	(4.17)	(3.40)	(3.88)	(0.49)
Panel D: Equal weighted CARs							
All IPOs	0.005	-0.023	-0.106**	-0.270***	-0.365***	-0.162***	-0.208***
	(0.36)	(-0.71)	(-2.33)	(-4.22)	(-4.66)	(-3.10)	(-3.75)
IPOs with	0.013	0.001	-0.059	-0.165***	-0.236***	-0.089*	-0.160***
Insider Trading	(1.00)	(0.03)	(-1.30)	(-2.58)	(-3.01)	(-1.71)	(-2.89)
No Trade IPOs	-0.016	-0.081***	-0.219***	-0.526***	-0.679***	-0.340***	-0.324***
	(-1.19)	(-2.52)	(-4.85)	(-8.22)	(-8.66)	(-6.50)	(-5.84)
Net buy IPOs	0.022*	-0.051	-0.179***	-0.375***	-0.483***	-0.251***	-0.254***
	(1.65)	(-1.59)	(-3.95)	(-5.85)	(-6.16)	(-4.80)	(-4.57)
Net sell IPOs	0.000	0.078***	0.120***	0.149***	0.133*	0.153***	-0.020
	(0.03)	(2.45)	(2.65)	(2.33)	(1.70)	(2.93)	(-0.37)

Panel E: Value weighted CARs							
All IPOs	0.028	-0.059	-0.256***	-0.399***	-0.351**	-0.303***	-0.076
	(1.16)	(-0.99)	(-3.05)	(-3.37)	(-2.41)	(-3.04)	(-0.74)
IPOs with	0.037	-0.058	-0.251***	-0.360***	-0.299**	-0.264**	-0.072
Insider Trading	(1.53)	(-0.98)	(-2.99)	(-3.03)	(-2.06)	(-2.65)	(-0.70)
No Trade IPOs	-0.003	-0.061	-0.274***	-0.537***	-0.530***	-0.436***	-0.092
	(-0.11)	(-1.03)	(-3.27)	(-4.53)	(-3.65)	(-4.38)	(-0.89)
Net buy IPOs	0.056***	-0.036	-0.343***	-0.639***	-0.655***	-0.487***	-0.223**
	(2.29)	(-0.60)	(-4.09)	(-5.39)	(-4.51)	(-4.89)	(-2.17)
Net sell IPOs	0.019	-0.081	-0.159*	-0.081	0.056	-0.041	0.079
	(0.76)	(-1.37)	(-1.89)	(-0.68)	(0.38)	(-0.41)	(0.77)

Table 3:
The behaviour of the equal weighted abnormal returns of insider trades

The table represents cumulative average abnormal returns around directors' share trading. We use the market-adjusted model with FTSE All Share Index and AIM all share price index as the proxy for market returns. We identify 2102 buy and 791 sell trades. (-40-2), (-1+1) and (+2+40) are for the cumulative abnormal returns over the -40-2 days, -1+1 days and +2+40 days relative to announcement date of the trade. M is for month and Y for Year. Panel A presents the results for each individual trade. Panel B. presents the aggregated trades for *Net Buy* and *Net Sell* IPOs. The sample period is limited to 36 months after the IPO to allow comparison with previous IPO studies. The sample period is 1999-2006. IPOs with positive (negative) *NPR* are classified as *Net Buy* (*Net Sell*), where *NPR* is the difference between total value of purchases and sells divided by total value of shares traded over this 36 months period after IPO. We identify 190 *Net Sell* IPOs and 353 *Net Buy* IPOs. The returns exclude first day returns. ***, **, * significant at 0.01, 0.05 and 0.10 level, respectively.

	N	-1Y	-6M	(-40 – 2)	(-1, +1)	(+2, +40)	+6M	+1Y	+2Y
Panel A. Cumulative Abnormal Returns around Insider Trading Announcements within 36 months post-IPO period									
Buy Trades	2,102	-0.143***	-0.125***	-0.112***	0.0359***	-0.0141**	-0.003	-0.042**	-0.074*
		(-7.60)	(-10.64)	(-18.4)	(13.95)	(-2.94)	(-0.11)	(-2.32)	(-1.93)
Sell Trades	791	0.364***	0.225***	0.0603***	-0.0011	-0.0247***	0.023	-0.039*	-0.066
		(16.34)	(13.84)	(6.89)	(-0.55)	(-3.54)	(1.65)	(-1.73)	(-1.08)
Panel B. Cumulative Abnormal Returns around Aggregate Insider Trading within 36 months post-IPO period									
Net Buy	1,622	-0.179***	-0.144***	-0.0767***	0.0260***	-0.0164**	-0.048***	-0.128***	-0.217***
		(-8.25)	(-10.37)	(-10.40)	(3.97)	(-2.40)	(-3.61)	(-6.10)	(-4.77)
Net Sell	1,271	0.231***	0.122***	0.0461***	-0.001***	-0.0146**	0.072***	0.066***	0.126***
		(11.44)	(9.01)	(5.25)	(-3.60)	(-2.57)	(6.00)	(3.40)	(2.92)

Table 4

Fama French Three-Factor Regressions on Calendar-Time Portfolio Returns (36 Months)

$$R_{pt} - R_{ft} = \alpha + \beta_t (R_{Mt} - R_{ft}) + \beta_{t-1} (R_{Mt-1} - R_{ft-1}) + \gamma_t SMB_t + \gamma_{t-1} SMB_{t-1} + \delta_t HML_t + \delta_{t-1} HML_{t-1} + \varepsilon_{pt}$$

	A	β_t	β_{t-1}	γ_t	γ_{t-1}	δ_t	δ_{t-1}	*Adj. R^2*
Panel A. Equally Weighted Returns 36 months post-IPO date								
All IPOs	-0.009***	0.883***		1.044***		-0.437**		0.70
	(-2.51)	(9.99)		(9.38)		(-1.99)		
	-0.009***	0.925***	0.317***	0.902***	0.175*	-0.415**	0.170	0.75
	(-2.56)	(9.93)	(3.68)	(8.13)	(1.67)	(-2.08)	(1.18)	
No Trade IPOs	-0.019***	0.909***		0.991***		-0.495 **		0.59
	(-3.79)	(7.24)		(6.86)		(-2.17)		
	-0.018***	0.906***	0.203	0.868***	0.257**	-0.499**	-0.293	0.61
	(-3.75)	(7.09)	(1.56)	(5.65)	(2.02)	(-2.30)	(-0.093)	
IPOs with Insider Trading	0.003	1.012***		1.219***		-0.952**		0.61
	(0.57)	(6.62)		(6.87)		(-2.54)		
	0.007	1.021***	0.156	1.125***	0.162	-0.957***	-0.525	0.63
	(1.09)	(6.39)	(0.956)	(6.65)	(0.76)	(-2.82)	(-1.32)	
Net Sell IPOs	0.021**	1.197***		1.071***		-1.286***		0.58
	(2.40)	(8.38)		(4.18)		(-3.53)		
	0.024***	1.193***	0.122	0.975***	0.157	-1.278***	-0.474	0.59
	(2.93)	(6.11)	(0.716)	(5.01)	(0.702)	(-3.401)	(-0.97)	
Net Buy IPOs	-0.015***	0.887***		1.101***		-0.448*		0.61
	(-3.56)	(8.25)		(7.50)		(1.87)		
	-0.013**	0.896***	0.309***	0.975***	0.241	-0.532**	-0.125	0.65
	(-2.95)	(8.06)	(2.83)	(7.10)	(1.63)	(-2.44)	(-0.38)	
Panel B Value Weighted Returns 36 months post-IPO date								
All IPOs	-0.000	1.548***		1.009***		-0.23		0.75
	(-0.06)	(13.28)		(4.90)		(-0.79)		
	0.003	1.550***	0.173	0.936***	-0.121	-0.253	-0.518*	0.76
	(0.72)	(14.86)	(1.27)	(5.51)	(-1.00)	(-0.85)	(-1.80)	
No Trade IPOs	-0.008	1.534***		1.168***		-1.457**		0.50
	(-1.22)	(5.20)		(4.83)		(-1.96)		
	-0.005	1.547***	0.409	0.963***	0.153	-1.499**	-0.088	0.51
	(-0.68)	(5.45)	(1.22)	(3.85)	(0.43)	(-2.08)	(-0.17)	
IPOs with Insider Trading	0.000	1.715***		1.212***		-0.770**		0.66
	(0.10)	(9.21)		(4.84)		(-1.92)		
	0.002	1.725***	0.134	1.127***	0.107	-0.769**	-0.195	0.66
	(0.47)	(8.78)	(0.63)	(5.08)	(0.56)	(1.92)	(-0.59)	
Net Sell IPOs	0.019**	1.732***		0.908***		-1.463***		0.52
	(2.39)	(6.16)		(3.62)		(-2.92)		
	0.020**	1.761***	0.156	0.824***	0.149	-1.475***	0.231	0.52
	(2.69)	(5.95)	(0.56)	(3.66)	(0.63)	(-2.99)	(0.408)	
Net Buy IPOs	-0.011**	1.697***		1.382***		-0.031		0.65
	(-1.95)	(9.05)		(4.41)		(-0.77)		
	-0.006	1.681***	0.215	1.279***	-0.138	-0.096	-0.630**	0.65
	(-0.98)	(9.72)	(1.11)	(4.61)	(-0.780)	(-0.24)	(-1.94)	

Panel C: Calendar Time Regressions 36 months post-trading date								
Buy trades	-0.018***	1.039***		1.079***		-0.506***		0.582
	(-3.76)	(12.52)		(6.63)		(-2.88)		
	-0.012***	0.945***	0.237***	0.909***	0.137	-0.372**	-0.421**	0.602
	(-3.06)	(12.39)	(3.12)	(5.64)	(1.32)	(-2.11)	(-2.41)	
Sell trades	-0.008	0.920***		1.322***		-0.815**		0.550
	(-1.54)	(8.71)		(4.65)		(-2.33)		
	0.016***	0.692***	-0.116	1.265***	0.508*	-0.602	-0.637**	0.534
	(2.88)	(5.64)	(-0.98)	(4.08)	(1.94)	(-1.56)	(-2.53)	

The table reports Fama and French (1993) three-factor model to assess long term performance of IPOs. $R_{pt} - r_{ft}$ is the excess return over the risk free rate on a portfolio in time period t, $R_{Mt} - R_{ft}$ is the market risk premium in period t, SMB_t is the return on small firms minus the return on large firms, and HML_t is the return on high book-to-market portfolio minus the return of the low book-to-market portfolio and Rft is the 3 months Treasury bill rate. We follow Ritter and Welch (2002) and include also the lagged factors. The return on FTSE All Share Price Index is the market return. IPOs with insider trades (543 IPOs) include any IPOs with at least one insider trades during 36 months period after IPO. *No Trade* (287 IPOs) include any IPOs without any insider trades during 36 months period after IPO. IPOs with positive (negative) Net Purchase Ratio, *NPR*, are classified as *Net Buy* (*Net Sell*), where *NPR* is the difference between total value of purchases and sells divided by total value of shares traded over this 36 months period after IPO. We identify 190 *Net Sell* IPOs and 353 *Net Buy* IPOs. The returns exclude first day returns. In Panel A and Panel B the 36 months returns are post IPO while Panel C reports the returns 36 months after the date of the trade. ***, **,* significant at 0.01, 0.05 and 0.10 level, respectively.

Table 5: OLS Regressions of 36 Months IPO Performance

	(1)	(2)	(3)	(4)	(5)	(6)	Net Buy	Net Sell	No Trade
Constant	2.35**	2.25**	1.79**	1.86**	1.78**	1.22*	2.94**	0.84	0.146
	(2.86)	(2.82)	(2.69)	(-2.33)	(2.27)	(1.92)	(2.42)	(0.54)	(0.09)
NPR transaction	-0.33***			-0.28***					
	(-4.20)			(-3.79)					
NPR value		-0.34***			-0.27***				
		(-5.42)			(-4.77)				
No Trade			-0.39***			-0.33**			
			(-3.78)			(-3.36)			
Underpricing	-0.002**	-0.002**	-0.002	-0.002**	-0.002*	-0.002**	-0.002*	-0.002	-0.003**
	(-2.31)	(-2.11)	(-2.81)	(-1.97)	(-1.83)	(-2.48)	(-1.87)	(-1.53)	(-2.11)
Log(Size)	-0.026	-0.042	-0.011	-0.007	-0.006	-0.017	-0.038	-0.048	-0.011
	(-0.79)	(-1.23)	(-0.37)	(-0.23)	(-0.18)	(-0.65)	(-0.81)	(-0.67)	(-0.17)
Overhang	-0.009*	-0.010*	-0.011**	-0.011**	-0.011**	-0.011**	-0.007	-0.012	-0.016
	(-1.67)	(-1.71)	(-2.17)	(-1.97)	(-1.97)	(-2.25)	(-1.02)	(-1.51)	(-1.58)
Prestigious Underwriter	0.13	0.16	0.16	0.04	0.07	0.09	0.11	0.25	0.15
	(1.12)	(1.37)	(1.41)	(0.41)	(0.66)	(0.88)	(0.68)	(1.01)	(0.55)
VC backing	0.000	-0.012	-0.07	-0.13	-0.13	-0.15	-0.074	0.16	-0.37
	(0.001)	(0.10)	(-0.65)	(-1.04)	(-1.11)	(-1.46)	(-0.41)	(0.65)	(-1.35)
Lockup expiry return	1.26	1.23	1.02**	1.48	1.45	1.01**	1.19**	1.63	0.56
	(3.10)	(3.05)	(2.15)	(3.80)	(3.76)	(2.12)	(2.08)	(1.56)	(0.97)
Log(Lockup length)	-0.31**	-0.30**	-0.29**	-0.39***	-0.37***	-0.30**	-0.46**	-0.03	-0.012
	(-2.45)	(-2.43)	(-2.42)	(-3.09)	(-3.03)	(-2.75)	(-2.39)	(-0.13)	(-0.05)
High tech dummy	-0.55***	-0.50***	-0.57***	-0.59***	-0.55***	-0.60***	-0.58	-0.37	-0.58*
	(-3.19)	(-2.95)	(-4.00)	(-3.69)	(-3.48)	(-4.10)	(-2.99)	(-1.25)	(-1.92)
Bubble dummy	-0.49***	-0.48***	-0.52***	--	--	--	-0.46**	-0.58**	-0.39*
	(-3.47)	(-3.48)	(-4.75)				(-2.81)	(-2.19)	(-1.86)
Hot Dummy	-0.32***	-031***	-0.38***	--	--	--	-0.37**	-0.21	-0.54**
	(-2.62)	(-2.73)	(-3.34)				(-2.22)	(-0.97)	(-1.98)
Takeover Probability	0.007	0.022	0.13	0.06	0.07	0.16	0.03	0.002	0.32*
	(0.06)	(0.19)	(1.25)	(0.50)	(0.62)	(1.57)	(0.20)	(0.009)	(1.67)
SEO Dummy	0.18	0.16	0.09	0.04	0.04	-0.007	0.11	0.25	-0.12
	(1.17)	(1.10)	(0.69)	(0.32)	(0.28)	(-0.06)	(0.63)	(0.93)	(-0.47)
Year Dummies	--	--	--	Yes	Yes	Yes	--	--	--
Adjusted R^2 (%)	12.8	14.5	10.9	19.7	20.6	15.5	8.4	3.1	6.5

The dependent variable for all regressions is 36 months cumulative abnormal returns for 830 IPOs that went public in London stock exchange from 1999 to 2006. *Underpricing* is the percent return on the first day from the offer price to the closing price. *Overhang* is the ratio of proportion retained to proportion sold. *Size* is the offer price times shares outstanding in 2008 millions of Pound Sterling constant terms. *Prestigious underwriters* is a dummy equal to 1 if the IPO is underwritten by a global underwriter defined in Derrien and Kecskes (2007). *Venture-backed* is dummy equal to one if the IPO is backed by venture capitalists. *Bubble period* is equal to 1 if the IPO is issued in the 1999-2000 period following Levis (2011). *High-tech Dummy* is equal to one if the IPO is in computer manufacturing, electronic equipment, computer and data processing services, and optical, medical and scientific equipment. *Hot market* is equal to 1 if the IPO is issued during the high volume period of January 1999 to March 2001 and January 2004 to end of 2006. *Takeover Probability* is a Dummy constructed by following Brar et al (2008). *SEO Dummy* is equal to 1 if the IPO raised further equity within 3-years of IPO. *Lockup exp ret* is the cumulative abnormal return from -2 to +2 days around the lockup expiration date. *Lockup length* is the number of days of lockup. *NPR transaction* (*NPR value)* is the number (value) of insider purchases minus the number (value) of insider sells divided by the total number (value) of insider transactions over 36 months after IPO. *No Trade* is a dummy equal to 1 if the IPO does not have any insider trades within 36 months of IPO. The *t*–statistics are in parentheses. , **, * significant at 0.01, 0.05, and 0.1 levels, respectively.

Table 6
Univariate Analysis of IPOs Insider Trades (within 3-years of IPO)

Panel A: Characteristics of IPOs with and without Insider Trades (within 3-years of IPO)

	IPOs with insider trades			No Trade IPOs	
	All	Net Sell	Net Buy		p-value of $\chi 2$
	(1)	(2)	(3)	(4)	
No of IPOs	543	190	353	287	
Underpricing (%)	19.58[a]	15.62[c]	21.78	28.18	0.10
Lockup length	388.5	378.5[bc]	395.0	398.3	0.20
Shares Locked (%)	93.98	92.2[c]	94.95	95.5	0.12
Size (2008 £m)	149.2	175.3	135.5	123.2	0.20
Overhang (%)	3.82	4.41	3.51	3.99	0.23
Prestigious Underwriter (%)	23.38[a]	27.36[bc]	21.30[d]	13.93	0.00
Venture backed (%)	15.83[a]	17.89[c]	14.77[d]	10.45	0.05
Institutional Holding (%)	60.7	58.9	59.94	63.41	0.16
$CAR_{(-40,-2)}$ (%)	1.01[a]	5.88[bc]	-1.58[d]	-3.29	0.00
Lockup Expiry Returns (%)	-1.59	-0.63[bc]	-2.10	-2.44	0.10
High tech Dummy (%)	11.23[a]	10.00	11.89[d]	8.34	0.17
Bubble Dummy (%)	19.33[a]	14.70[bc]	21.18[d]	27.18	0.00
Hot Dummy (%)	80.29[a]	76.84[bc]	82.15[d]	87.80	0.00
Takeover Probability (%)	23.38[a]	18.94[bc]	25.77[d]	41.46	0.00
SEO Dummy (%)	16.60	13.68	17.56	13.93	0.11
Market-to-book	6.31[a]	6.67[b]	5.17[d]	7.44	0.05
Standard deviation	0.029[a]	0.026[bc]	0.030	0.031	0.01

Panel B. Means [Medians] underpricing, long run performance and Net Buy and Net Sell

	N	Underpricing (%)	CARs (%)	Net Sell	Net Buy
Market value>median	416	26.4[10.7]***	-61.9[-50.5]**	33.4[138]***	26.1[60]***
Market value<median	415	18.6[9.0]	-45.1[-44.9]	16[13]	10[9]
p-value		0.00	0.05	0.00	0.00
Prestigious underwriter	166	9.1[6.7]***	-26.4[-0.002]	27.36***	21.12
Other underwriter	665	26.0[10.5]	-38.7[-32.7]	17.96	19.28
p-value		0.00	0.14	0.00	0.24
Venture-backed	116	28.8[9.0]	-46.4[-48.2]	17.89**	14.73
Non-venture-backed	715	21.5[10.0]	-34.5[23.2]	12.81	13.41
p-value		0.13	0.18	0.03	0.29
Main Market	141	18.6[7.7]	-25.4[-0.002]	87.65***	81.11**
AIM	690	23.5[10.0]	-38.4[-28.9]	68.42	86.11
p-value		0.21	0.14	0.00	0.03
Institutional holding	504	22.8[9.2]	-36.1[-20.8]	58.94	61.75
No Institution holding	327	22.1[10.5]	-36.4[-30.3]	62.50	61.63
p-value		0.28	0.48	0.19	0.48
Bubble period	183	32.1[9.7]***	-84.4[-79.1]***	14.73***	21.81
Non-bubble period	648	16.4[10.0]	-22.6[-13.7]	24.21	22.22
p-value		0.00	0.00	0.00	0.44
Hot market	676	27.1[10.0]	-44.3[-32.8]***	76.84***	82.15
Cold market	155	18.9[7.1]	7.4[18.9]	84.68	83.43
p-value		0.12	0.00	0.00	0.31

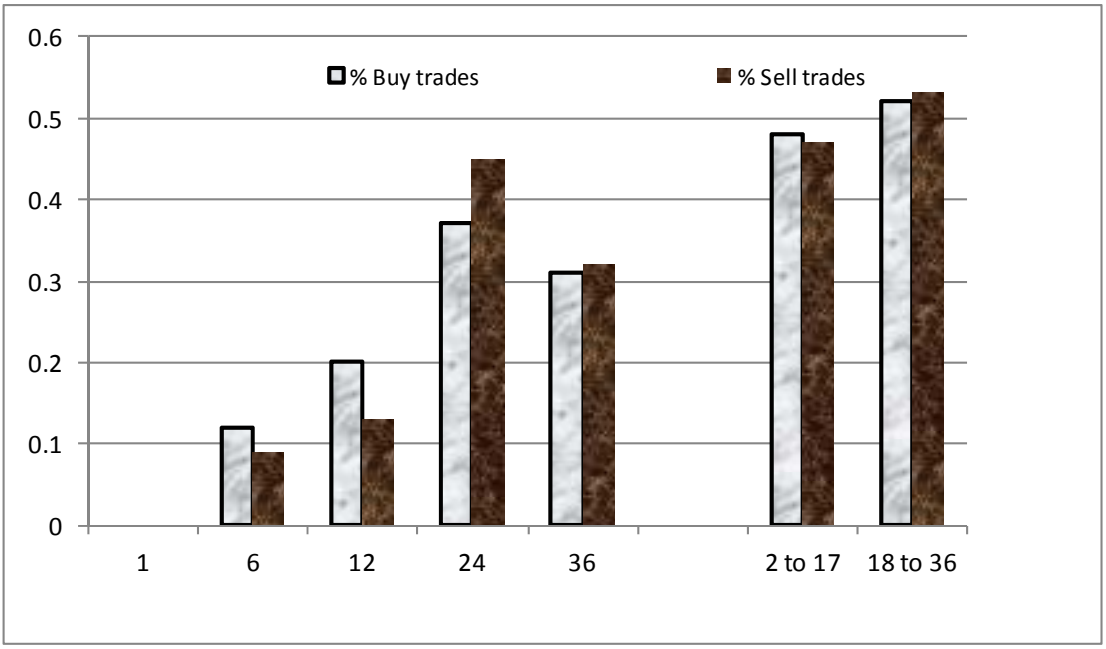
The table reports the univariate analysis to assess the likelihood of insider trading. The sample includes 287 IPOs without insider trading over the 36 months after the IPO, and 543 IPOs with insider trading, slit into 190 *Net Sell* and 353 *Net Buy* IPOs. We do not report the medians in the last two columns because the variables are dummies. *Underpricing* is the percent return on the first day from the offering price to the closing price. *CAR* are the equal weighted cumulative abnormal returns over 36 months after the IPO. *Lockup length* is the lockup period in days, *Shares locked* is the ratio of shares locked to shares outstanding *Size* is the market value of equity in 2008 constant terms. *Overhang* is the ratio of proportion retained to proportion sold. *Prestigious underwriter* is equal to 1 if a global investment bank defined in Derrien and Kecskes (2007) has underwritten the issue. *Venture-backed* is the proportion of IPOs backed by venture capitalist. *Institutional Holding* is the proportion of companies where institutions hold more than 3%. $CAR_{(-40,-2)}$ are the cumulative abnormal return over pre-event window. For the no trade sample, we measure the 39-day abnormal return as the abnormal return over the whole period standardised to 39 days. *Lockup expiry returns* is the Cumulative abnormal return over -2 to+2 around lockup expiration. *High-tech Dummy* is equal to one if the IPO is in computer manufacturing, electronic equipment, computer and data processing services, and optical, medical and scientific equipment. *Bubble period* is equal to 1 if the IPO is issued in 1999-2000 period following Levis (2011). *Hot market* is equal to 1 if the IPO is during January 1999 to March 2001 and January 2004 to end of 2006. *Cold market* is the remaining sample period. *Takeover Probability* is a dummy constructed by following Brar et al (2008). *SEO Dummy* takes value of one if the IPO raised further Equity within 3-years of IPO. We report *p*-values for the mean difference test between different subsamples. $^{a, b, c}$ indicate significant differences between IPOs with insider trading vs. *No Trade*, *Net Sell* vs. *Net Buy*, *Net Sell* vs. *No Trade*, and *Net Buy* vs. *No Trade*, respectively. $\chi 2$ tests for homogeneity across the *No Trade*, *Net Sell*, and *Net Buy* samples. $^{***, **, *}$ significant at 0.01, 0.05, and 0.1 levels, respectively.

Table 7.
Logit Analysis of Insider Trades within 36 Months of IPO

Panel A:	*Net Sell* = 1 *No Trade* = 0		*Net Buy* =1 *No Trade* = 0		*Net Buy* =1 *Net Sell* =0		*Net Sell* = 2 *Net Buy* = 1 *No Trade* = 0
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant	1.208	0.218	0.486	0.356	-2.057	-0.698	
	(0.54)	(0.26)	(0.27)	(0.50)	(-1.08)	(-1.00)	
$CAR_{(-40,-2)}$	3.869***	4.204***	1.375	1.215	-2.557***	-2.942***	2.875***
	(3.08)	(3.32)	(1.56)	(1.46)	(-2.75)	(-3.03)	(3.59)
Underpricing	-0.0005	-0.002	-0.0001	-0.001	0.004	0.001	0.000
	(-0.037)	(-1.00)	(-0.108)	(-1.00)	(0.25)	(0.50)	(-0.37)
Shares Locked	-0.006	-0.003	0.005	0.001	0.011**	0.009*	-0.009**
	(-0.75)	(-0.43)	(0.07)	(0.17)	(1.93)	(1.80)	(-1.93)
Log(Lockup length)	-0.454	-0.001	-0.091	-0.001	0.478*	0.002**	-0.260
	(-1.26)	(-1.00)	(-0.33)	(-1.00)	(1.58)	(2.00)	(-1.18)
Overhang	0.008	0.010	-0.016*	-0.016*	-0.014	-0.012	0.003
	(0.58)	(0.77)	(-1.63)	(-1.60)	(-1.00)	(-0.80)	(0.35)
Prestigious	0.074	0.967	0.475**	0.566**	0.422	-0.234	0.069
Underwriters	(0.21)	(3.20)	(1.90)	(2.44)	(1.57)	(-0.98)	(0.38)
VC backing	0.589*	0.777**	0.380	0.378	-0.074	-0.229	0.390***
	(1.70)	(2.29)	(1.41)	(1.41)	(-0.25)	(-0.79)	(2.01)
Institutional holding	-0.311	-0.340	-0.122	-0.099	0.251	0.297	-0.218
	(-1.23)	(-1.42)	(-0.66)	(-0.55)	(1.15)	(1.41)	(1.51)
Takeover Probability	-0.764***	-1.210	-0.680***	-0.74***	0.220	0.406**	-0.554***
	(-2.73)	(-4.73)	(-3.47)	(-4.02)	(0.25)	(1.71)	(-3.44)
SEO Dummy	-0.010	-0.032	0.242	0.066	0.324	0.064	0.017
	(-0.02)	(0.59)	(0.98)	(1.24)	(1.08)	(1.16)	(0.11)
Log(Size)	0.410***		0.075		-0.327***		0.189***
	(4.47)		(1.17)		(-4.12)		(3.72)
MB	-0.005		-0.014***		-0.009		-0.008**
	(-0.70)		(-2.03)		(-0.71)		(-1.74)
σ_{Ri}	-3.239		4.875		6.175		-1.469
	(-0.45)		(1.03)		(0.87)		(-0.34)
Lockup expiry return	0.744		0.062		-1.343		0.482
	(0.793)		(0.09)		(-1.29)		(0.82)
Pseudo R^2 (%)	23.2	19.60	7.8	5.97	12.4	8.55	6.10

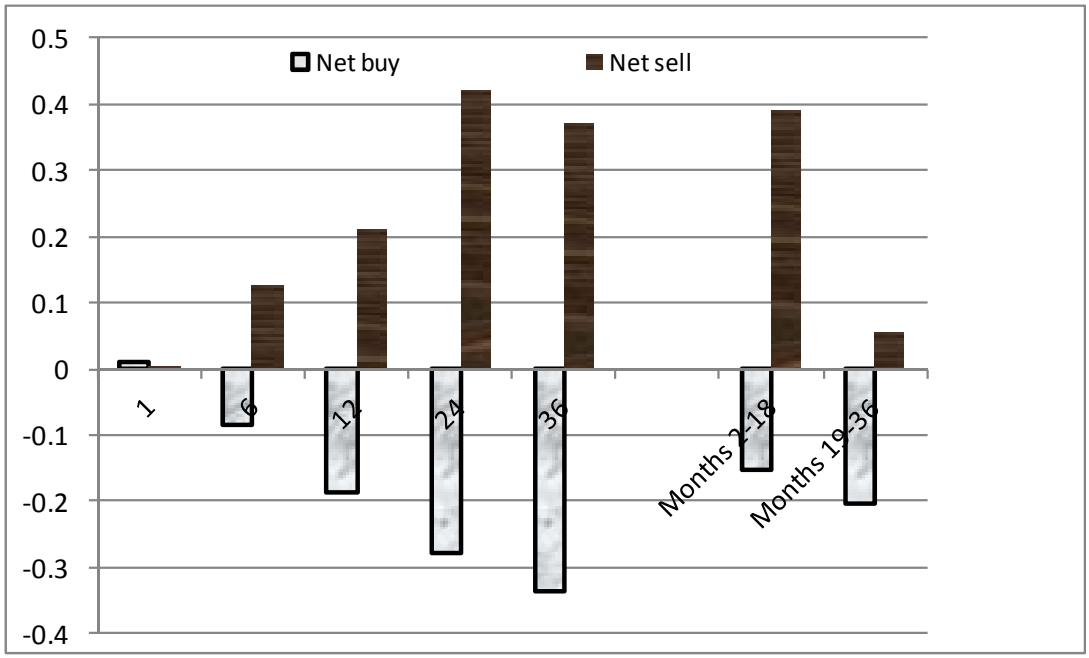
The dependent variable in the first two equations is a dummy equal to one for IPOs if insiders are net sellers (*Net Sell,* N = 190) and zero for no trade IPOs (*No Trade,* N = 287). In the second two equations, the dependent variable is a dummy equal to one for IPOs if insiders are net buyers (*Net Buy*, N = 353), and zero for no trades (*No Trade*). In the last two equations, the dependent is dummy variable equal to one for *Net Buy* IPOs and zero for *Net Sell* IPOs. $CAR_{(-40,-2)}$ are the cumulative abnormal return over pre-event window. For the no trade sample, we measure the 39-day abnormal return as the abnormal return over the whole lockup period standardised to 39 days. *Underpricing* is the percent return on the first day from the offering price to the closing price. *Venture backed* is dummy variable equal to one venture capitalist is present. *Prestigious underwriter* is a dummy equal to 1 if the IPO is underwritten by a global underwriter defined in Derrien and Kecskes (2007). *Lockup length* is the log of the lockup period. *Size* is the log of market value of equity in 2008 constant terms. *Shares locked* is the number of shares locked over the holdings of insiders. *Overhang* is the ratio of shares retained to shares sold. *Institutional Holding* is the proportion of companies where institutions hold more than 3%. *Takeover Probability* is based on Brar et al (2008) methodology. *SEO Dummy* is equal to 1 if the IPO has raised further Equity within 3-years of IPO. The standard deviation of returns, σ_{Ri}, is measured across the 36 months after the IPO. The *t*–statistics are in parentheses. , **, * significant at 0.01, 0.05, and 0.1 levels, respectively.

Figure 1. Distribution of buy and sell trades



The figure reports the distribution of the proportion of the buy and sell trades over the 36 months period after IPOs. The sample includes 2,102 buy trades and 791 sell trades undertaken in 830 UK IPOs over the period 1999-2006. The event periods 2 to 18 and 19 to 26 months indicate whether the trades occur during the first or second part of our sample period.

Figure 2. Style-adjusted Buy-and-Hold Long-run Returns of Net Buy and Net Sell IPOs



We compute the Buy-and-hold returns relative to size and book-to-market control firms. We construct our samples as follows. We first select IPOs with insider trades (543 out of 830), which includes any IPOs with at least one insider trade during 36 months period after IPO. Then we compute the Net purchase ratio, *NPR*, as the difference between total value of purchases and sells, divided by total value of shares traded over this 36 months period after IPO. IPOs with positive (negative) *NPR* are classified as *Net Buy* (*Net Sell*) IPOs. We identify 190 *Net Sell* IPOs and 353 *Net Buy* IPOs. To remove the effect of first day return we compute the first month return without first day return.

[1] See Jenkinson and Ljungqvist (2001), Ritter and Welch (2002), Ritter (2003), and Eckbo, Masulis and Norli (2007) for extensive reviews. As explained in the review of the literature section, the significance of these returns depends on the methodology used. We do not analyse underpricing and the behaviour of share prices on the lockup expiry dates (See, e.g., Field and Hanka, 2001; Brav and Gompers, 2003; Hoque and Lasfer, 2011). We use the returns on these dates and the first day returns as explanatory factors.

[2] In general, underwriters can support prices by stimulating demand or by restricting supply in the aftermarket and in many countries temporary price support in IPOs is legal including the US (1934 Securities Act, Rule 10b-7, since replaced by Regulation M) and UK (Securities and Investment Board Rules, chapter III, Part 10). We do not have data to test for such trading by the underwriters.

[3] See Subrahmanyam (2007) and Barberis and Thaler (2003) for a review. Kaustia (2004) argues that the disposition effect is clearly identifiable in the IPO market because the offer price is a common purchase price. He finds that when the stock price is below the offer price the volume is low, but the volume increases when the price surpasses the offer price for the first time, and when the stock achieves new maximum and minimum price, consistent with the reference price effect. This may apply mainly to periods closer to the IPO date, and we think that three years time may be too long to consider the offer price as a reference price. In addition, insiders might be anchoring on the price they initially receive their stock at which, unfortunately, is not available.

[4] Ritter and Welch (2002) find that the average beta of their IPOs in 1980-2001 of 1.73. We find 1.60.

[5] There are many studies that document the negative long-run performance, including Ritter (1991), Loughran (1993), Loughran and Ritter (1995), Rajan and Servaes (1997), Brav and Gompers (1997), Gompers and Lerner (1999), Teo, Welch, and Wong (1998) for the US market, Finn & Higham's (1988) for Australia, Kunz and Aggarwal (1994) for Switzerland, and Keloharju (1993) for Finland. See Jenkinson and Ljungqvist (2001), Ritter and Welch (2002), and Ritter (2003) for extensive reviews.

[6] Fama (1998) concluded that "the apparent (long run performance) anomalies are methodological illusions" (p 285). He argues that even little change to the methodology can change the empirical results.

[7] The UK Model Code prescribes much faster reporting of directors' dealings. The directors must inform their company as soon as possible after the transaction and no later than the fifth business day after a transaction for their own account or on behalf of their spouses and children (Hillier and Marshall, 2002). In turn, the firm must inform the LSE without delay and no later than the end of the business day following receipt of the information. This implies that the information reaches the market as late as 6 days after transaction. In contrast, in the US, during the pre-Sarbanes-Oxley period, insiders have to report their trades on the 10th of the month following the transaction, resulting in a maximum delay of between 10 and 42 days, depending on the trading date. As a result, most previous studies could not analyse insider-trading event on or before the lockup expiry date.

[8] As an alternative to AIM all share price index, we used the Hoare Govett Smaller Companies (HGSC) Index as the market index. Our results are qualitatively similar.

[9] Espenlaub et al (2001) find mean (median) lockup of 561 (730) days in 1992-1998 when the lockup contracts are compulsory for mineral and scientific research based firms with less than three years trading records.

[10] Levis (2011) obtained an R^2 of 1.4% for Non-private equity backed, 7.5% for venture capitalists-backed and 0.05% for buyout IPOs. Goergen, Khurshed and Mudambi (2007) report R^2 for all firms of 8.45%. However, they report R^2 of 6.38% and 13.58% for small firms and large firms respectively.

[11] See Korczak, et al. (2010) for a recent review and the specificities of the UK vs. US regulatory regimes and the difficulties in identifying what constitutes private information and an insider, and thus, the complexities in enforcing the insider trading rules. U.K. regulations prohibit trading by insiders who possess any price sensitive information, and insider trading is a criminal offence since the introduction of the Companies Act 1980. Unlike US, UK insiders are banned from trading in 'prohibited periods', which include 'close periods' of up to 60 days associated with earnings announcement, and any periods when there is 'any matter which constitutes inside information in relation to the company'. In addition, insiders have to get clearance from the chairman or a director designated in the company for this purpose, outside the 'prohibited periods' except for permissions to sell when an insider does not possess any inside information and has 'a pressing financial commitment that cannot be satisfied otherwise than by selling the relevant securities of the company'.

[12] We follow Derrien and Kecskes (2007) and include in prestigious underwriters global investment banks such as ABN AMRO (including Hoare Govett), Cazenove & Co., Credit Lynnais Securities, Dresdner Kleinwort Wassertein, HSBC Securities, Credit Suisse, Investec Hendersen Crosthwaite securities, KBC Securities, Peel Hunt, Lehman brothers, Nomura International, Schroder Salomon Smith Barney, SG securities, UBS, West LB, Merrill Lynch International, Goldman Sachs.

[13] Bubble period is 1999-2000 (Levis, 2011), and hot period is high IPO volume in 2000 and 2004-2006.

[14] We also run the regressions with *bubble*, *hot* and *high tech* dummies. We find the same results, but we do not report them for space considerations.